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**Optically-Inscribed High Efficiency Diffraction Gratings in Azo Polymer Films**

**by**

**C. Barrett, A. Natansohn and P. Rochon**

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OPTICALLY-INScribed HIGH EFFICIENCY DIFFRACTION GRATINGS IN AZO POLYMER FILMS. Christopher J. Barrett and Almeria L. Natansohn\*, Department of Chemistry, Queen's University, Kingston, Ontario, Canada K7L 3N6. Paul L. Rochon, Department of Physics, Royal Military College, Kingston, Ontario, Canada K7K 5L0.

A series of amorphous azobenzene-containing polymers were cast as thin films and shown to produce both reversible volume diffraction gratings and high-efficiency surface gratings by laser irradiation at an absorbing wavelength. The latter process involves localized mass transport of the polymer chains to a high degree, as atomic force microscopy reveals surface profile depths near that of the original film thickness. A mechanism for this phenomenon is proposed which involves pressure gradients as a driving force, present due to different photochemical behaviors of the azo chromophores at different regions of the interference pattern. This mechanism of photoinduced viscoelastic flow agrees well with the results of experiments investigating the effect of the polarization state of the interfering writing beams and the photochemical behavior of the chromophore, the free volume requirements of the induced geometric changes, and the viscoelastic flow of the material.

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